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From this ellipse we get the following elements :—

$P = 179{\cdot}7$ years. $i = 69^{\circ}{\cdot}4$
$T = 1843{\cdot}7$ ☊ $= 146^{\circ}{\cdot}2$
$e = 0{\cdot}142$ $\lambda = 313^{\circ}{\cdot}9$
$a = 6''{\cdot}25$ $\omega = 166^{\circ}{\cdot}7$

According to this orbit the distance will slowly diminish until it is little more than $2''$, and then gradually increase again until the maximum of nearly $5''{\cdot}4$ is reached, when one complete revolution will have been described since the observation of Herschel. It happens that he discovered this pair when the distance was the greatest, and Struve observed it when the distance was minimum.

I hope observers with large apertures will regularly measure this system. The angular motion should steadily increase for some years.

Chicago :
May 24.

The Orbit of Sirius. By S. W. Burnham, M.A.

In *Monthly Notices* for 1891 April (vol. li. p. 378) I gave a list of all the measures of the companion of *Sirius*, and a diagram showing the ellipse which seemed to represent the observations as a whole as well as this could be done. I did not undertake to give from this ellipse the elements of the real orbit, for the reason that this and all other orbits of *Sirius*, down to this time, are necessarily only provisional, and roughly approximate at the best, and their interest will cease as soon as the companion can be measured again. It will then be in the third quadrant, or about 180° of position-angle, and a good set of measures at that time should fix the movement of the companion with considerable certainty. For the present all we need is the apparent orbit, in order to know about where to look for the small star. In the paper referred to I gave the period according to this orbit as fifty-three years. Dr. T. J. J. See has recently examined the original diagram, and has called my attention to an error in this quantity. I have gone over the matter carefully, and find that in some way I have made a considerable error in the period as published in my paper.

In the course of this re-examination I have deduced the remaining elements from this ellipse as follows :—

$P = 51{\cdot}97$ years. $i = 50^{\circ}{\cdot}8$
$T = 1893{\cdot}5$ ☊ $= 40^{\circ}{\cdot}3$
$e = 0{\cdot}568$ $\lambda = 135^{\circ}{\cdot}4$
$a = 8''{\cdot}31$ Per. (app.) $= 253^{\circ}{\cdot}0$

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Whatever the final orbit may be, I do not think any other can be made at this time to better represent the observations. It will be seen that this differs from Auwers' orbit of the theoretical star (*Ast. Nach.* 3084) by 2·57 years in the period. In some of the other elements the difference is a little more.

Chicago:
May 30.

Probable Errors of Greenwich Observations of Close Circumpolar Stars. By T. Lewis.

In the *Monthly Notices* for 1889 April, Mr. Downing gives the probable error of a result for R.A. as obtained with the Greenwich transit circle at different zenith distances, and for the four close circumpolar stars. He finds for λ *Ursæ Minoris*, δ *Ursæ Minoris*, and *Cephei* 51, whether above or below pole, sensibly the same result in equatorial arc, viz., $\pm^{s}\cdot030$; but for *Polaris* the result is $\pm^{s}\cdot020$.

This probable error includes not only the errors of observation, but those of the determinations of instrumental position. In nearly all cases where these stars have been kept "for place," the azimuthal error has been deduced from consecutive transits of *Polaris*, which doubtless accounts for the smaller value of the resulting probable error in the case of *Polaris*.

The results obtained by Mr. Downing for the circumpolars relate to eye and ear observations, whether over the fixed galvanic wires or over the same wire set to different readings of the transit micrometer. From 1889 January 1 these stars have been observed chronographically by moving the centre wire with the transit micrometer until the star is accurately bisected, and recording the instant of bisection on the chronograph with the left hand. Moreover, the list of circumpolar stars under constant observation at Greenwich has been increased (since 1888 September) by the addition of all those whose ephemerides are given in the *Connaissance des Temps*, or M. Lœwy's Annual Tables.

The following additional information with regard to the observation of close circumpolars is therefore of interest:—

(1) *The errors of bisection* and *of eye and ear estimates.* The separate bisections, or estimates of transits, were reduced to the centre wire and compared with the mean result. Observations of the close circumpolar stars, made both before and after 1889 January 1, were considered, and the results for each of the four regular observers kept separate. The probable errors are reduced to the equator.

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